IN THE CLAIMS

1. (currently amended) In a computerized 3D graphical image rendering system for performing visible surface determination, a method of generating depth information, comprising the steps of:

representing depth information by a piecewise function, each piece of the piecewise function defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

upon receiving a primitive object, dividing the primitive object according to areas defined by at least one ~~analytic~~ analytical function, each analytical function representing depth information for the area of the primitive object;

performing a visibility test based on depth information for the areas; and

updating the piecewise function based on the results of the visibility test.

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2. (original) The method of claim 1 wherein each piece of the piecewise function is an analytical function of a predefined class defined by corresponding parameters.

3. (original) The method of claim 2 wherein the analytical function is a linear function.

4. (original) The method of claim 2 wherein the analytical function is a non-linear function.

5. (currently amended) The method of claim 1 wherein ~~a dynamic search structure is used for fast access to areas of a split overlapping with the primitive object~~ performing a visibility test is accomplished by using a dynamic search structure to access overlapping areas.

6. (previously presented) The method of claim 5 wherein the dynamic search structure is a tree-based structure.

7. (original) The method of claim 1 wherein each piece of the piecewise function is defined on a segment of a scanline.

8. (currently amended) An apparatus for generating depth information for a 3D image, comprising:

a first module ~~for representing~~ configured to represent depth information for the 3D image by a piecewise function, each piece of the piecewise function defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

a second module ~~for dividing~~ configured to divide a primitive object according to areas defined by at least one ~~analytic~~ analytical function upon receiving the primitive object, each analytical function representing depth information for the area defined by the analytical function;

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a third module ~~for performing~~ configured to perform a visibility test based on depth information for the areas; and

a fourth module ~~for performing~~ configured to update the piecewise function based on any results of the visibility test.

9. (currently amended) The apparatus of claim 8 wherein ~~the first module processes~~ the piecewise function is a piecewise analytical function.

10. (currently amended) The apparatus of claim [[9]] 8 wherein ~~the first module processes~~ the piecewise function is a piecewise linear function.

11. (currently amended) The apparatus of claim [[9]] 8 wherein ~~the first module processes~~ the piecewise function is a piecewise non-linear function.

12. (currently amended) The apparatus of claim 8 further comprising a module implementing a dynamic search structure for selectively accessing a set of ~~the~~ piecewise function parameters.

13. (original) The apparatus of claim 12 wherein the dynamic search structure is a tree-based structure.

14. (original) The apparatus of claim 8 wherein each piece of the piecewise function is defined on a segment of a scanline.

15. (currently amended) An apparatus for performing visible surface determination of ~~3D images~~ a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

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a span generator ~~for generating spans~~ configured to generate at least one span for each of the primitive objects, ~~a~~ each span corresponding to ~~each~~ a horizontal scan line occupied by the primitive object, the span characterized by position data and depth data; and

a visible surface determination module responsive to the depth data associated with each of the spans~~, for determining~~ and configured to determine at least one visible segment ~~visible segments~~ for each of the spans by comparing the depth information for ~~each~~ the span with depth information ~~defined by an area represented by a piecewise function,~~ for at least one area in an (x,y) space, each area in the (x,y) space represented by a piece of a piecewise function, each piece of the piecewise function representing depth data for the area in the (x,y) space, and for generating position data corresponding to each of the visible segments ~~of each of the spans~~.

16. (currently amended) The apparatus of claim 15 further comprising a ~~means for storing~~ storage module configured to store the position data corresponding to each of the visible segments ~~of each~~

~~of the spans and for causing storage of depth data~~ and to store depth data corresponding to each of the visible segments ~~of each of the spans~~.

17. (currently amended) A system for performing visible surface determination on ~~3D images~~ a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

a processing device;

a display device coupled to the processing device ~~for displaying~~ and configured to display the 3D ~~image~~ image;

a graphics engine coupled to the processing device ~~for performing~~ and configured to generate at least one span for each of the primitive objects and to perform visual surface determination by comparing depth information for ~~a~~ at least one span with depth information ~~defined by an area represented by a piecewise function~~ for areas in an (x,y) space, each area in the (x,y) space defined by a piece of a piecewise function, each piece of the piecewise function representing depth information for the area in the (x,y) space; and

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a storage device ~~for storing results~~ configured to store results of the visible surface determination.

18. (currently amended) The system of claim 17 wherein the graphics engine further comprises a span generator ~~for generating spans~~ configured to generate spans for each primitive object corresponding to ~~each horizontal scanline~~ horizontal scanlines of the primitive object.

19. (currently amended) The system of claim 18 wherein the graphics engine further comprises a visible surface determination module coupled to the span generator ~~for determining visible segments~~, the visible surface determination module configured to determine at least one visible segment for each span.

20. (currently amended) The system of claim 17 wherein the storage device stores the results of the visual surface determination in a linked-list format.

21. (currently amended) The system of claim 17 wherein the storage device stores the results of the visual surface determination in a binary tree format.

22. (currently amended) The system of claim 17 wherein the results of the visual surface determination comprise information indicative of relative depth of a first visible segment in ~~relations~~ relation to a second visible segment.

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23. (currently amended) A computer readable medium having embodied thereon a program, the program being executable by a machine to perform method steps for performing visible surface determination on a 3D image, the method steps comprising:

representing depth information ~~of a primitive object~~ of the 3D image by a piecewise function, each piece of the piecewise function for the image defining an area in an (x,y) space and representing depth information for the area in the (x,y) space;

~~upon receiving the primitive object~~ dividing ~~the~~ a primitive object according to areas defined by at least one ~~analytic~~ analytical function, each analytical function representing depth information for the area defined by the analytical function;

performing a visibility test based on depth information for the areas; and

updating the piecewise function based on the results of the visibility test.

24. (currently amended) A system for performing visible surface determination on ~~3D images~~ a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

means for representing depth information by a piecewise function, each piece of the piecewise function for the 3D image defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

upon receiving a primitive object, means for dividing the primitive object according to areas defined by at least one ~~analytic~~ analytical function, each analytical function representing depth information for the area defined by the analytical function;

means for performing a visibility test based on depth information for the areas; and

means for updating the piecewise function based on the results of the visibility test.

25. (currently amended) In a computerized 3D graphical image rendering system for performing visual surface determination, a method of generating depth information, comprising the steps of:

upon receiving a primitive object, dividing the primitive object into areas in an (x,y) space, the areas delimited by splits ~~wherein splits are defined by analytic functions~~, each split defined by an analytical function, each area defined by a piece of a piecewise function, each piece of the piecewise function representing depth information for the area of the primitive object; and

~~representing depth information for at least one of the areas by an analytic function; and~~

performing a visibility test based on the depth information for the areas.

26. (new) The method of claim 1 wherein each piece of the piecewise function is an analytical function.

27. (new) The method of claim 1 wherein performing a visibility test further comprises determining visible portions of the primitive object.

28. (new) The method of claim 1 wherein performing a visibility test further comprises determining intersection points for at least two of the analytical functions to determine visible portions of the primitive object.

29. (new) The method of claim 28 wherein performing a visibility test further comprises:

solving a system of at least two analytical functions to determine intersection points; and

determining visible portions of the primitive objects based on the intersection points.

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30. (new) The method of claim 1 wherein each area is a region.

31. (new) The method of claim 1 wherein each area is a span.